

<b>EPA</b> United States Environmental Protection Agency Washington, DC 20460 <b>Work Assignment</b>						Work Assignment Number 1-01				
						<input type="checkbox"/> Other <input type="checkbox"/> Amendment Number:				
Contract Number EP-D-11-006			Contract Period   04/29/2011   To   03/28/2012 Base <input checked="" type="checkbox"/> Option Period Number			Title of Work Assignment/SF Site Name GHG Monitoring Handbook				
Contractor EASTERN RESEARCH GROUP, INC.					Specify Section and paragraph of Contract SOW B					
Purpose: <input checked="" type="checkbox"/> Work Assignment <input type="checkbox"/> Work Assignment Close-Out <input type="checkbox"/> Work Assignment Amendment <input type="checkbox"/> Incremental Funding <input type="checkbox"/> Work Plan Approval						Period of Performance  From   06/30/2011   To   03/28/2012				
Comments: Greenhouse Gas Monitoring Handbook This work assignment includes 300 hours for the preparation of the work plan and to begin work on the work assignment.										
<input type="checkbox"/> Superfund                      Accounting and Appropriations Data <input checked="" type="checkbox"/> Non-Superfund										
Note: To report additional accounting and appropriations data use EPA Form 1900-69A.										
SFO (Max 2) <input type="checkbox"/>										
Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										
Authorized Work Assignment Ceiling										
Contract Period:		Cost/Fee:				LOE: 0				
04/29/2011 To 03/28/2012										
This Action:						300				
Total:						300				
Work Plan / Cost Estimate Approvals										
Contractor WP Dated:				Cost/Fee:			LOE:			
Cumulative Approved:				Cost/Fee:			LOE:			
Work Assignment Manager Name    Dennisk Mikel							Branch/Mail Code:			
_____ (Signature)                      (Date)							Phone Number    919-541-5511			
							FAX Number:			
Project Officer Name    Reconstruct User							Branch/Mail Code:			
_____ (Signature)                      (Date)							Phone Number:			
							FAX Number:			
Other Agency Official Name							Branch/Mail Code:			
_____ (Signature)                      (Date)							Phone Number:			
							FAX Number:			
Contracting Official Name    Rodney-Daryl Jones							Branch/Mail Code:			
_____ (Signature)                      (Date)							Phone Number:    919-541-3112			
							FAX Number:			

## Statement of Work

**Contract: ERG EP-D-11-006**

**WA: 1-01 Greenhouse Gas Monitoring Handbook**

**WAM: Dennis Mikel**

### I. BACKGROUND

The primary Greenhouse Gases (GHGs) that are directly emitted by human activities in general are those reported in EPA's annual *Inventory of U.S. Greenhouse Gas Emissions and Sinks* and include carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF<sub>6</sub>). The primary effect of these gases is their influence on the climate system by trapping heat in the atmosphere that would otherwise escape to space. This heating effect (referred to as radiative forcing) is very likely to be the cause of most of the observed global warming over the last 50 years. Global warming and climate change can, in turn, affect health, society, and the environment. There also are some cases where these gases have other non-climate effects. For example, elevated concentrations of CO<sub>2</sub> can lead to ocean acidification and stimulate terrestrial plant growth, and CH<sub>4</sub> emissions can contribute to background levels of tropospheric ozone, a criteria pollutant. These effects can in turn be influenced by climate change in certain cases. Carbon dioxide and other GHGs can also have direct health effects but at concentrations far in excess of current or projected future ambient concentrations.

Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF<sub>6</sub>) are potent greenhouse gases, and some persist in the environment for thousands of years. These gases, referred to as high global warming potential gases (high GWPs) are from 140-23,900 times more potent than CO<sub>2</sub> in terms of their capabilities to trap heat in the atmosphere over a 100-year period. Also, because they remain in the atmosphere almost indefinitely, concentrations of these gases will increase as long as emissions continue.

The purpose of this work assignment is to create a document that will be utilized by regulators and industry as a reference document on the monitoring and measurement of the GHGs. It will answer questions regarding their use, quality of the data collected and measurement uncertainty.

ERG has worked with OAQPS to compile and review the performance test data and information in support of emission and ambient sensing instruments, emission factors and regulation development.

### II. TASKS

#### Task 1

The Contractor shall initiate and coordinate the technical activities of the staff assigned to this project. The Contractor shall provide monthly progress and resource utilization reports to the EPA work assignment contracting officer representative (WACOR) for this work assignment (WA).

It is the policy of OAQPS that within the constraints of available resources, quality assurance (QA) activities associated with environmental data operations (EDO) that involve secondary data shall be conducted to assure the data will be adequate and sufficient for their planned secondary use. Secondary data are defined as data that are utilized for a purpose other than that for which they were initially collected. No secondary data will be generated by this WA, therefore, a Quality Assurance Project Plan is not required.

## Task 2

The product of this work assignment will be a draft Handbook that regulators and industry can employ when considering or operating these GHG instruments. This Handbook will also discuss potential issues with GHG instruments and techniques for emissions factors development, models and other atmospheric process needs. The Handbook will list potential GHG sensing methods and the advantages (and disadvantages) of their use. As part of this Handbook, the Contractor shall research demonstrated GHG monitoring and provide information and assessment of any pertinent test reports.

An outline of the Handbook is attached within this WA. The Contractor shall deliver to the WACOR any sections or subsections that have been finished for initial review. EPA requires the WA be created in two phases. Phase I will consist of Section 1 (Introduction) and Section 2 (Emission Monitoring and Measurement of Flux) and be provided in final draft form by September 30, 2011. For Phase II, Section 3 (Fenceline and Background Measurements) will be provided by the contractor in final draft form by September 30, 2011. Once each subsection (e.g., 2.1 Carbon Dioxide) is reviewed, the Contractor shall incorporate the changes suggested. The WACOR will review, provide additional comments, as needed, to the Contractor, for incorporation into a final draft of the protocol.

## Provisos

To ensure that there is no appearance or likelihood that Agency policies or decisions are made by non-EPA employees or that Agency policy-makers and decision-makers are not improperly influenced by recommendations presented as contract deliverables, contractors shall be required to: (a) explain and rank any recommended policy or action alternatives, (b) describe procedures used to arrive at such recommendations, (c) summarize the substance of deliberations, (d) report any dissenting views, (e) list sources relied upon, and/or (f) otherwise make clear the methods and considerations upon which the recommendations are based. WACORs and their first line supervisors will be responsible for ensuring that work assignment statements of work do not require the contractor to make policy decisions.

To the best of our knowledge, this work does not duplicate any previous or current work being done by this office.

### III. SCHEDULE OF DELIVERABLES

Task	Activity	Date	Comments
1	(a) Contractor provides work plan	Within 20 days after effective date of the WA	NA
	(b) Provide Monthly Progress Reports	At the end of each month	
2	(a) Contractor drafts sections/subsections of the GHG Handbook	As they are finished	NA
	(b) Provide Phase I draft	September 30, 2011	
	(c) Provide Phase II draft	September 30, 2011	

### IV. REPORTING REQUIREMENTS

The reporting requirements are in accordance with the terms and conditions of the contract.

## Appendix A – Outline of the GHG Handbook

### **1. Introduction**

- 1.1. Concept and Scope
- 1.2. What the document is and isn't
  - 1.2.1. Target Audience and Purpose
  - 1.2.2. Relation to Other GHG Rules and Guidance
- 1.3. Quality Assurance and Quality Control
- 1.4. EPA Quality System
- 1.5. Method Strengths and Limitation Summary

### **2. Emission Monitoring and Measurement of Flux**

#### **2.1. Carbon Dioxide**

- 2.1.1. Existing/Demonstrated Technology
  - 2.1.1.1. Technology Description
  - 2.1.1.2. How it works
  - 2.1.1.3. Other Regulatory Applications
  - 2.1.1.4. QA/QC
  - 2.1.1.5. Examples of Method Application
  - 2.1.1.6. Advantages and Limitations
- 2.1.2. Future Technologies
  - 2.1.2.1. Technology Description
  - 2.1.2.2. How it works
  - 2.1.2.3. Procedure Documentation Status (e.g., no procedure/minimal procedure/research or journal articles, draft procedure in preparation)
- 2.1.3. Gaps and Needs
- 2.1.4. References

#### **2.2. Methane**

- 2.2.1. Existing/Demonstrated Technology
  - 2.2.1.1. Technology Description
  - 2.2.1.2. How it works
  - 2.2.1.3. Other Regulatory Applications
  - 2.2.1.4. QA/QC
  - 2.2.1.5. Examples of Method Application
  - 2.2.1.6. Advantages and Limitations
- 2.2.2. Future Technologies
  - 2.2.2.1. Technology Description
  - 2.2.2.2. How it works
  - 2.2.2.3. Procedure Documentation Status

2.2.3.Gaps and Needs

2.2.4.References

### **2.3. Nitrous Oxide**

2.3.1.Existing/Demonstrated Technology

2.3.1.1. Technology Description

2.3.1.2. How it works

2.3.1.3. Other Regulatory Applications

2.3.1.4. QA/QC

2.3.1.5. Examples of Method Application

2.3.1.6. Advantages and Limitations

2.3.2.Future Technologies

2.3.2.1. Technology Description

2.3.2.2. How it works

2.3.2.3. Procedure Documentation Status

2.3.3.Gaps and Needs

2.3.4.References

### **2.4. Fluorocarbons**

2.4.1.Existing/Demonstrated Technology

2.4.1.1. Technology Description

2.4.1.2. How it works

2.4.1.3. Other Regulatory Applications

2.4.1.4. QA/QC

2.4.1.5. Examples of Method Application

2.4.1.6. Advantages and Limitations

2.4.2.Future Technologies

2.4.2.1. Technology Description

2.4.2.2. How it works

2.4.3.Procedure Documentation Status

2.4.4.Gaps and Needs

2.4.5.References

### **2.5. Sulfur Hexafluoride**

2.5.1.Existing/Demonstrated Technology

2.5.1.1. Technology Description

2.5.1.2. How it works

2.5.1.3. Other Regulatory Applications

2.5.1.4. QA/QC

2.5.1.5. Examples of Method Application

2.5.1.6. Advantages and Limitations

- 2.5.2.Future Technologies
  - 2.5.2.1. Technology Description
  - 2.5.2.2. How it works
- 2.5.3.Procedure Documentation Status
- 2.5.4.Gaps and Needs
- 2.5.5.References

## **2.6. Flow Measurements**

- 2.6.1.Existing/Demonstrated Technology
  - 2.6.1.1. Technology Description
  - 2.6.1.2. How it works
  - 2.6.1.3. Other Regulatory Applications
  - 2.6.1.4. QA/QC
  - 2.6.1.5. Examples of Method Application
  - 2.6.1.6. Advantages and Limitations
- 2.6.2.Future Technologies
  - 2.6.2.1. Technology Description
  - 2.6.2.2. How it works
- 2.6.3.Procedure Documentation Status
- 2.6.4.Gaps and Needs
- 2.6.5.References

## **2.7. Nitrogen Trifluoride**

- 2.7.1.Existing/Demonstrated Technology
  - 2.7.1.1. Technology Description
  - 2.7.1.2. How it works
  - 2.7.1.3. Other Regulatory Applications
  - 2.7.1.4. QA/QC
  - 2.7.1.5. Examples of Method Application
  - 2.7.1.6. Advantages and Limitations
- 2.7.2.Future Technologies
  - 2.7.2.1. Technology Description
  - 2.7.2.2. How it works
- 2.7.3.Procedure Documentation Status
- 2.7.4.Gaps and Needs
- 2.7.5.References

## **3. Fenceline and Background Measurements**

### **3.1. Carbon Dioxide**

- 3.1.1.Existing/Demonstrated Technology
  - 3.1.1.1. Technology Description
  - 3.1.1.2. How it works

- 3.1.1.3. Other Regulatory Applications
- 3.1.1.4. QA/QC
- 3.1.1.5. Examples of Method Application
- 3.1.1.6. Advantages and Limitations
- 3.1.2.Future Technologies
  - 3.1.2.1. Technology Description
  - 3.1.2.2. How it works
- 3.1.3.Procedure Documentation Status
- 3.1.4.Gaps and Needs
- 3.1.5.References

### **3.2. Methane**

- 3.2.1.Existing/Demonstrated Technology
  - 3.2.1.1. Technology Description
  - 3.2.1.2. How it works
  - 3.2.1.3. Other Regulatory Applications
  - 3.2.1.4. QA/QC
  - 3.2.1.5. Examples of Method Application
  - 3.2.1.6. Advantages and Limitations
- 3.2.2.Future Technologies
  - 3.2.2.1. Technology Description
  - 3.2.2.2. How it works
- 3.2.3.Procedure Documentation Status
- 3.2.4.Gaps and Needs
- 3.2.5.References

### **3.3. Nitrous Oxide**

- 3.3.1.Existing/Demonstrated Technology
  - 3.3.1.1. Technology Description
  - 3.3.1.2. How it works
  - 3.3.1.3. Other Regulatory Applications
  - 3.3.1.4. QA/QC
  - 3.3.1.5. Examples of Method Application
  - 3.3.1.6. Advantages and Limitations
- 3.3.2.Future Technologies
  - 3.3.2.1. Technology Description
  - 3.3.2.2. How it works
- 3.3.3.Procedure Documentation Status
- 3.3.4.Gaps and Needs
- 3.3.5.References

### **3.4. Fluorocarbons**

- 3.4.1.Existing/Demonstrated Technology

- 3.4.1.1. Technology Description
- 3.4.1.2. How it works
- 3.4.1.3. Other Regulatory Applications
- 3.4.1.4. QA/QC
- 3.4.1.5. Examples of Method Application
- 3.4.1.6. Advantages and Limitations
- 3.4.2.Future Technologies
  - 3.4.2.1. Technology Description
  - 3.4.2.2. How it works
- 3.4.3.Procedure Documentation Status
- 3.4.4.Gaps and Needs
- 3.4.5.References

### **3.5. Sulfur Hexafluoride**

- 3.5.1.Existing/Demonstrated Technology
  - 3.5.1.1. Technology Description
  - 3.5.1.2. How it works
  - 3.5.1.3. Other Regulatory Applications
  - 3.5.1.4. QA/QC
  - 3.5.1.5. Examples of Method Application
  - 3.5.1.6. Advantages and Limitations
- 3.5.2.Future Technologies
  - 3.5.2.1. Technology Description
  - 3.5.2.2. How it works
- 3.5.3.Procedure Documentation Status
- 3.5.4.Gaps and Needs
- 3.5.5.References

### **3.6. Nitrogen Trifluoride**

- 3.6.1.Existing/Demonstrated Technology
  - 3.6.1.1. Technology Description
  - 3.6.1.2. How it works
  - 3.6.1.3. Other Regulatory Applications
  - 3.6.1.4. QA/QC
  - 3.6.1.5. Examples of Method Application
  - 3.6.1.6. Advantages and Limitations
- 3.6.2.Future Technologies
  - 3.6.2.1. Technology Description
  - 3.6.2.2. How it works
- 3.6.3.Procedure Documentation Status
- 3.6.4.Gaps and Needs
- 3.6.5.References

<b>EPA</b> United States Environmental Protection Agency Washington, DC 20460 <b>Work Assignment</b>						Work Assignment Number 1-01				
						<input type="checkbox"/> Other <input checked="" type="checkbox"/> Amendment Number: 000001				
Contract Number EP-D-11-006			Contract Period   04/29/2011   To   03/28/2012 Base <input checked="" type="checkbox"/> Option Period Number			Title of Work Assignment/SF Site Name GHG Monitoring Handbook				
Contractor EASTERN RESEARCH GROUP, INC.					Specify Section and paragraph of Contract SOW					
Purpose: <input type="checkbox"/> Work Assignment <input type="checkbox"/> Work Assignment Close-Out <input checked="" type="checkbox"/> Work Assignment Amendment <input type="checkbox"/> Incremental Funding <input type="checkbox"/> Work Plan Approval						Period of Performance  From   06/30/2011   To   03/28/2012				
Comments: The work plan dated 08/19/11 has been reviewed and we concur with the labor mix, technical hours (894), ODCs, total estimated costs \$81,577 and completion date 03/28/12. The deliverable for Phase I draft is 11/30/11 and Phase II is 03/28/12. This document is IAW the CMM 7.3.5.1 (D)										
<input type="checkbox"/> Superfund                      Accounting and Appropriations Data <input checked="" type="checkbox"/> Non-Superfund										
Note: To report additional accounting and appropriations data use EPA Form 1900-69A.										
SFO <input type="checkbox"/> (Max 2)										
Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										
Authorized Work Assignment Ceiling										
Contract Period:		Cost/Fee:				LOE: 300				
04/29/2011 To 03/28/2012										
This Action:						594				
Total:						894				
Work Plan / Cost Estimate Approvals										
Contractor WP Dated:				Cost/Fee:		LOE:				
Cumulative Approved:				Cost/Fee:		LOE:				
Work Assignment Manager Name    Dennisk Mikel  <div style="display: flex; justify-content: space-between;"> <div>_____ (Signature)</div> <div>_____ (Date)</div> </div>						Branch/Mail Code: Phone Number    919-541-5511 FAX Number:				
Project Officer Name    Margaret Dougherty  <div style="display: flex; justify-content: space-between;"> <div>_____ (Signature)</div> <div>_____ (Date)</div> </div>						Branch/Mail Code: Phone Number:    919-541-2344 FAX Number:				
Other Agency Official Name  <div style="display: flex; justify-content: space-between;"> <div>_____ (Signature)</div> <div>_____ (Date)</div> </div>						Branch/Mail Code: Phone Number: FAX Number:				
Contracting Official Name    Rodney-Daryl Jones  <div style="display: flex; justify-content: space-between;"> <div>_____ (Signature)</div> <div>_____ (Date)</div> </div>						Branch/Mail Code: Phone Number:    919-541-3112 FAX Number:				

<b>EPA</b> United States Environmental Protection Agency Washington, DC 20460 <b>Work Assignment</b>						Work Assignment Number 1-01				
						<input type="checkbox"/> Other <input checked="" type="checkbox"/> Amendment Number: 000002				
Contract Number EP-D-11-006			Contract Period   04/29/2011   To   03/28/2012 Base <input checked="" type="checkbox"/> Option Period Number			Title of Work Assignment/SF Site Name GHG Monitoring Handbook				
Contractor EASTERN RESEARCH GROUP, INC.					Specify Section and paragraph of Contract SOW					
Purpose: <input type="checkbox"/> Work Assignment <input type="checkbox"/> Work Assignment Close-Out <input checked="" type="checkbox"/> Work Assignment Amendment <input type="checkbox"/> Incremental Funding <input type="checkbox"/> Work Plan Approval						Period of Performance  From   06/30/2011   To   03/28/2012				
Comments: The purpose of this change is to add 125 hours at no additional charge to the Government. The contractor is not required to submit a revised work plan or cost estimate. This document is IAW the CMM 7.3.5.1 (D)										
<input type="checkbox"/> Superfund                      Accounting and Appropriations Data <input checked="" type="checkbox"/> Non-Superfund										
Note: To report additional accounting and appropriations data use EPA Form 1900-69A.										
SFO <input type="checkbox"/> (Max 2)										
Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										
Authorized Work Assignment Ceiling										
Contract Period:		Cost/Fee:		LOE: 894						
04/29/2011 To 03/28/2012										
This Action:				125						
Total:				1,019						
Work Plan / Cost Estimate Approvals										
Contractor WP Dated:				Cost/Fee:			LOE:			
Cumulative Approved:				Cost/Fee:			LOE:			
Work Assignment Manager Name    Dennisk Mikel  <div style="display: flex; justify-content: space-between;"> <div>_____ (Signature)</div> <div>_____ (Date)</div> </div>							Branch/Mail Code:			
							Phone Number    919-541-5511			
							FAX Number:			
Project Officer Name    Margaret Dougherty  <div style="display: flex; justify-content: space-between;"> <div>_____ (Signature)</div> <div>_____ (Date)</div> </div>							Branch/Mail Code:			
							Phone Number: 919-541-2344			
							FAX Number:			
Other Agency Official Name  <div style="display: flex; justify-content: space-between;"> <div>_____ (Signature)</div> <div>_____ (Date)</div> </div>							Branch/Mail Code:			
							Phone Number:			
							FAX Number:			
Contracting Official Name    Rodney-Daryl Jones  <div style="display: flex; justify-content: space-between;"> <div>_____ (Signature)</div> <div>_____ (Date)</div> </div>							Branch/Mail Code:			
							Phone Number: 919-541-3112			
							FAX Number:			